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Original Article

Antiulcer activity of *Polycarpaea corymbosa* (L.) Lam. whole plant extracts (Caryophyllaceae)

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ABSTRACT

The objective of this study was to investigate the antiulcer activity of whole plant of *Polycarpaea corymbosa* in rats. Antiulcer effects of the ethanol extracts at 250 and 500 mg/Kg were evaluated in rats using ethanol induced and indomethacin induced ulcer models. Phytochemical analysis was carried out using standard procedure. Results showed that the ethanol extract exhibited significant and dose dependent antiulcer activity in the models used. Percentage ulcer inhibitions of extract at 500 mg/Kg for ethanol and indomethacin induced ulcer were 67.27% and 62.72% respectively. Ulcer protection in the model used by the extract is dose dependent and the ulcer inhibitory effects of the extract are comparable to omeperazole. Therefore, a result of the present study suggests that the ethanol extract of *Polycarpaea corymbosa* possesses antiulcer activity.

1. Introduction

Peptic ulcer is one of the common disorders of gastrointestinal tract, which occur due to an imbalance between the offensive (gastric acid secretion) and defensive (gastric mucosal integrity) factors [1]. Stress, smoking, nutritional deficiencies and frequent intake of non-steroidal anti-inflammatory drugs (NSAIDs) develop the peptic ulcer prevalence in the world [2]. It is a known fact that well-targeted therapeutic approaches are needed for the treatment of peptic ulcer disease.

A wide range of drug is currently available for treatment of gastric ulcer which includes proton pump inhibitors, H2- blockers, antacids and anticholinergics. The most common adverse effects of these drugs are hypergastrinemia, hypersensitivity, gynecomastia, impotence, arrhythmia and blood dyscrasias such as thromboxy to penia and enteric infections (Clostridium difficile) [3]. These effects are the rationale for the development of new antiulcer drugs. For this reason, the hunt is still on to discover a natural medicine having antiulcerogenic properties.

Current treatment of ulcers in developing countries has been largely suppressing pain, with little or no strategy aimed at acute. Herbal medicine is fast emerging as alternative synthetic drugs for treatment of ulcer possibly due to lower costs, availability, lower adverse effects and perceives effectiveness. Many tropical herbs have been scientifically reported to possess potent antiulcer activity [4-6].

Polycarpaea corymbosa (L.) Lam. belongs to 'Caryophyllaceae" is commomnly known as "Pallipoondu" in Palliyar tribals of Sirumalai hills, Western Ghats, Tamil Nadu. Paste prepared from the leaf is taken once in a day for a period of 2-3weeks to treat jaundice by the Palliyars. [7] Biological activities such as anti-inflammatory, antioxidant and hepatoprotectivity were carried out [8-10]. The study was defined to evaluate the antiulcer activity of the whole plant of *Polycarpaea corymbosa* in animal model.

2.Materials and Methods

2.1.Plant materials

Whole plant of *Polycarpaea corymbosa* (L.) Lam was collected from Sirumalai hills, Western Ghats, Tamil Nadu.With the help of local flora, voucher specimens were identified and preserved in the Ethnopharmacology Unit, Research Department of Botany, V.O.Chidambaram College, Tuticorin, Tamil Nadu for further references.

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2.2 Preparation of plant extract

The whole plant of *Polycarpaea corymbosa* were dried separately under shade and then powdered with a mechanical grinder to obtain a coarse powder, which were then subjected to extraction in a Soxhlet apparatus using ethanol. The ethanol extract were concentrated in a rotatory evaporator. The concentrated ethanol extracts of whole plant of *Polycarpaea corymbosa* were used for phytochemical screening and antiulcer activity.

2.3. Animals

Normal healthy male Wistar albino rats (180-240g) were used for the present investigation. Animals were housed under standard environmental conditions at temperature (25±20C) and light and Dark (12:12h). Rats were fed with standard pellet diet (Goldmohur brand, MS Hindustan Lever Ltd., Mumbai, India) and water *ad libitum*.

2.4. Acute Toxicity Studies

Acute oral toxicity study was performed as per OECD-423 guidelines (acute toxic class method), albino rats of either sex selected by random sampling were used for acute toxicity study [11]. The animals were kept fasting for overnight and provided only with water, after which the extracts were administered orally at 5mg/kg body weight by gastric incubations and observed for 14 days. If mortality was observed in two out of three animals, then the dose administered was assigned as toxic dose. If mortality was observed in one animal then the same dose was repeated again to confirm the toxic dose. If mortality was not observed, the procedure was repeated for higher doses such as 50, 100 and 2000 mg/kg body weight.

2.5. Ethanol induced gastric ulcer

Experimental setup

The animals were divided into four groups of six rats each.

Group I: Rats treated with 4% W/V aqueous tween 80 (10 ml/Kg p.o) for 7 days

Group II: Rats treated with ethanol extract of whole plant of *Polycarpaea corymbosa*, at the dose of 250 mg/Kg body weight daily for 7 days.

Group III: Rats received ethanol extract of whole plant of *Polycarpaea corymbosa*, at the dose of 500 mg/Kg body weight daily for 7 days.

Group IV: Rats treated with Omeprazole (20 mg/Kg) body weight.

Gastric ulcers were induced in rats by administration of 8 ml/Kg 90% v/v ethanol to all groups by orally. Animals were fasted for 24hours with free access to water prior to the test. Ethanol extract of *Polycarpaea corymbosa*, control (4% tween 80) and the standard drug (omeprazole) were given orally 30 minutes before administration of ethanol (90% v/v; 8ml/Kg) [12].

2.6. Indomethacin induced gastric ulcer

Experimental setup

The animals were divided into four groups of six rats each. Gastric ulcers were induced in rats by administration of indomethacin (40 mg/Kg p.o) to all groups by orally. The animals were sacrificed four hour after treatment [13].

2.7. Measurement of ulcer index

Immediately after the animals were sacrificed, their stomachs were dissected out, cut along the greater curvature and the mucosa were rinsed with cold normal saline to remove blood contamination, if any. The sum of the length (mm) of all lesions for each stomach was used as the ulcer index (UI) and the percentage of inhibition (%I) was calculated using the following formula [14]

$$\%I = (USC - USt) / USc \times 100$$

Where, USc = ulcer surface area in control

USt = ulcer surface area in treated animals

3.Results

In the present study the preliminary phytochemical analysis reveals the presence of alkaloid, coumarin, glycoside, flavonoid, terpenoid, saponin, phenol, steroid and tannins. Results of acute toxicity shows the plant is safe upto a maximum doses 2000 mg/Kg.

Ulcer index and present of protection against ulcers in the ethanol induced ulcer model and indomethacin induced ulcer model are shown in table-1. The treatment with ethanol extract of *Polycarpaea corymbosa* (500 mg/Kg) showed significant protection against ulcer in free treatment (67.27% and 62.72%) respectively for ethanol and indomethacin induced ulcer when compared with the control animals. The standard drug, omeperazole showed significant ($p<0.01$) protective effects against ulcers (76.60% and 78.74% for ethanol and indomethacin induced ulcers respectively) at a dose of 20 mg/Kg when compared with control groups when both treatment.

Ethanol (8 ml/Kg) and indomethacin (40 mg/Kg) administered respectively in the production of gastric mucosal damage. The ulcer index in control animals were 23.04 and 18.54 for ethanol and indomethacin induced ulcers respectively. Ethanol extract of *Polycarpaea corymbosa* (500 mg/Kg) significantly ($p<0.01$) reduced the ulcer index as compared to control. Omeperazole, a standard antiulcer drug showed ulcer index 5.39 and 3.94 for ethanol and indomethacin ulcer (Table-1).

Table 1: Effect of ethanol extract of Polycarpaea corymbosa on ethanol and Indomethacin induced gastric ulcer in rats.

Group	Ethanol (8 ml/kg)		Indomethacin (40 mg/kg)	
	Ulcer Index	Percentage Inhibition (% I)	Ulcer Index	Percentage Inhibition (% I)
Group I	23.04±1.33	-	18.54±1.29	-
Group II	11.51±1.09*	50.04	9.46±0.34**	48.97
Group III	7.54± 0.36**	67.27	6.91±0.76**	62.72
Group VI	5.39±0.52**	76.60	3.94±0.16**	78.74

Data are represented as mean ± S.E.M. Statistical analysis was done by one-way ANOVA followed by Dunnett's multiple comparison test.

*P < 0.01 and **P < 0.001 as compared to control (n = 6 in each group).

4. Discussion

Antiulcer activities were performed on Wistar albino rats of either sex using ethanol and indomethacin induced models. The ethanol extracts of *Polycarpaea corymbosa* (250 & 500 mg/Kg) showed significant antiulcer activity.

Antiulcer activity was carried out in two different models. The ethanol and indomethacin ulcers. The percentage of ulcer protection is observed in both the models but the extend of percentage protection is more in ethanol induced ulcer.

The percentage of ulcer protection variance with standard omeperazole (20 mg/Kg) and ethanol extract of *Polycarpaea corymbosa* (500 mg/Kg) is comparatively very less. The ulcer index is also reduced. Ulcer index parameter was used for the evaluation of antiulcer activity since ulcer formation is directly related to factors such as reduction in gastric volume, degrees in free and total activity. Ethanol extract of Polycarpaea corymbosa whole plant at the dose of 500 mg/Kg and omeperazole (20 mg/Kg) had showed significant ($p<0.01$) reduction in the ulcer index.

Ethanol induced gastric ulcer was employed to study the cytoprotective effect of the extracts. Ethanol induced gastric lesion formation may be due to stasis in gastric blood flow which contributes to the development of the hemorrhage and necrotic aspects of tissue injury. Alcohol rapidly penetrates the gastric mucosa apparently causing cell and plasma membrane permeability to sodium and water. The massive intracellular accumulation of calcium represents a major step in the pathogenesis of gastric mucosal injury. This leads to cell death and exfoliation in the surface epithelium [15].

Indomethacin is known to induce the reactive oxygen metabolites in animal models, which may contribute to mucosal injury [16]. Prostaglandin, a key molecule that stimulates the complex array of ulcer healing mechanism, gets synthesized in the mucosal cells by cyclooxygenase (COX) enzymes. It stimulates the secretion of biocarbonate and mucus, maintains mucosal blood flow and regulates mucosal turn over and repair [17, 18].

The phytoconstitutions like flavonoids, tannins, terpenoids and saponin have been reported in several anti-ulcer literatures as possible gastro protective agents. Flavonoids, tannins and triterpenoids are among the cytoprotective active materials for which antiulcerogenic efficacy has been extensively confirmed [19].

Tannins may prevent ulcer development due to their protein precipitating and vaso constriction effects. Their astringent action can help precipitating micro proteins on the ulcer site, thereby forming an impervious layer the lining that hinders gut secretions and protects the underlying mucosa from toxins and other irritants [20]. The phytoconstituents found in the *P. corymbosa* extract were flavonoids, tannins, terpenoids and saponin. These phytoconstituents present in the *P. corymbosa* extract could be the possible agents in the prevention of ulcers in the rats.

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